Welcome to ESAC

The European Space Astronomy Centre

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ESA ESAC, Science Directorate

Software Product Assurance Workshop 2023, 26/09/2023

ESAC – a bit of history

1978: VILSPA, opening of ESA Villafranca Satellite Tracking Station, support to IUE mission

~1978

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1995: ISO launch with Mission and Science Operations Centres onsite

1999: XMM-Newton launch and Science Operations Centre

2004: VILSPA became ESAC reflecting extension of activities

2023: ESAC today about 450 people

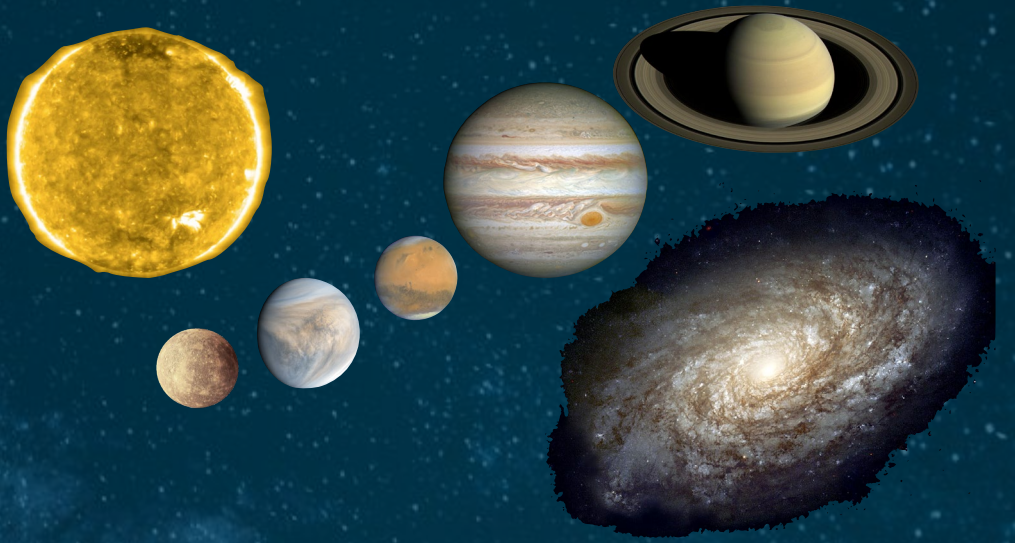
- Science Operations Centres for all Science missions
- Science Archives for Science missions and HRE
- Earth Observation SMOS Spanish National Centre
- ESA GNSS Support Centre
- CAB – Centro de Astro Biologia (INTA)
- Satellite Tracking Station (-> Cebreros)

2023

ESA Directorate of Science

Budget: ~600 M€ yearly, defined at ESA's Ministerial Conference every three years

Staff: ~250 staff + ~250 contractors at ESAC, ESTEC, STScI and GSFC



A programme covering space missions in

- Heliophysics
- Planetary Science
- Astronomy and Fundamental Physics

The scientific community in the ESA Member States is consulted at regular intervals

- to provide the broad science schemes
- to select individual missions within a scheme

COSMIC OBSERVERS

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IN DEVELOPMENT

ACTIVE

LEGACY

ariel (2029)

roman (2026)

euclid (2023)

plato (2026)

xrism (2022)

einstein probe (2022)

athena (2034)

lisa (2037)

webb (2021)

hubble (1990–)

gaia (2013–)

cheops (2019–)

xmm-newton (1999–)

integral (2002–)

microwaves

sub-millimetre

infrared

optical

ultraviolet

x-rays

gamma rays

gravitational waves

planck (2009–2013)

herschel (2009–2013)

iso (1995–1998)

akari (2006–2011)

hipparcos (1989–1993)

corot (2006–2014)

iue (1978–1996)

exosat (1983–1986)

hitomi (2016)

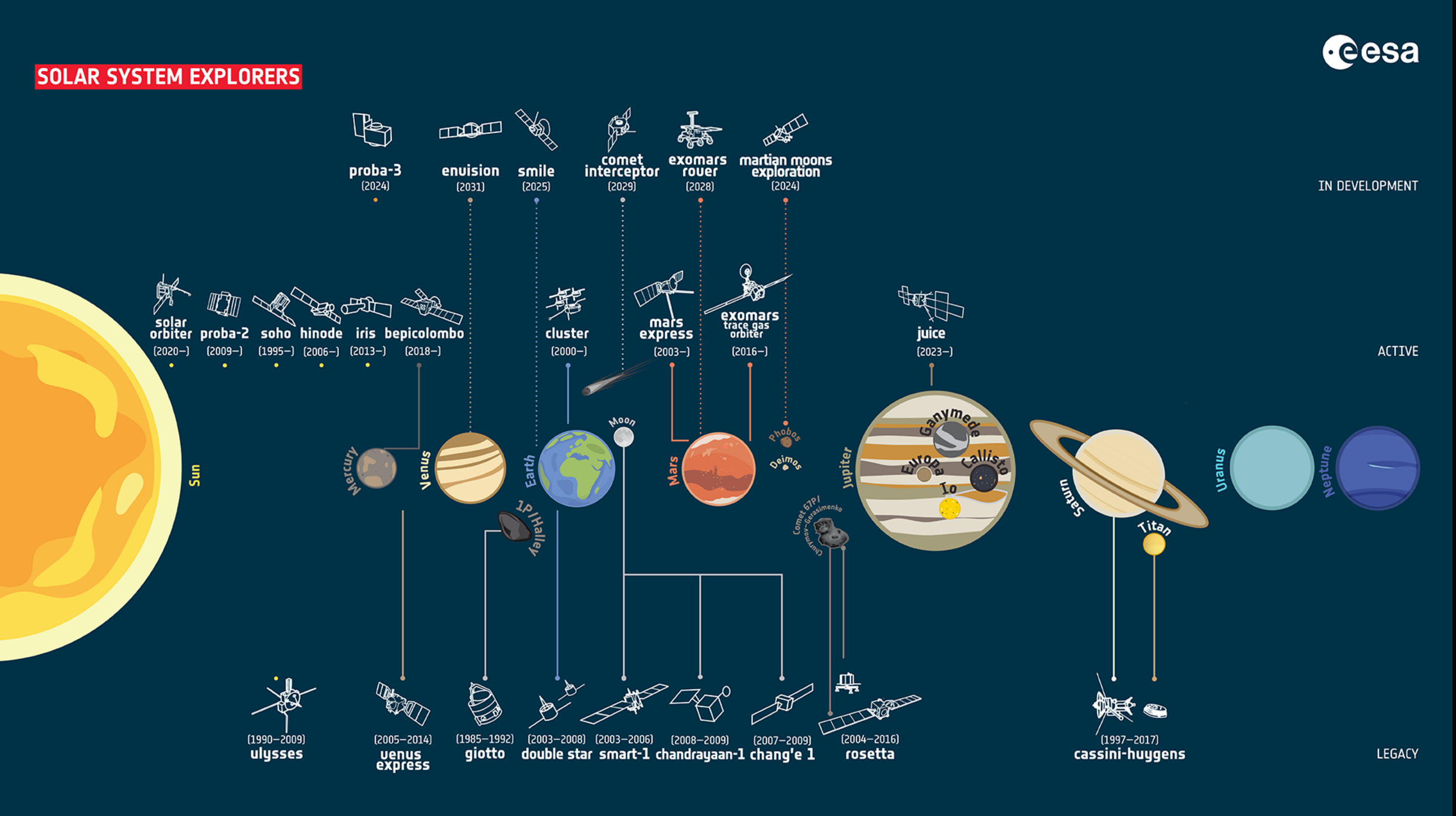
suzaku (2005–2015)

cos-b (1975–1982)

lisa pathfinder (2015–2017)

microscope (2016–2018)

SOLAR SYSTEM EXPLORERS



Science Ground Segment

Mission Science Objectives

Science Operations designed to make best use of ESA and external elements and competences.

Mission Science Data and Products

Mission Management after in-orbit-commissioning

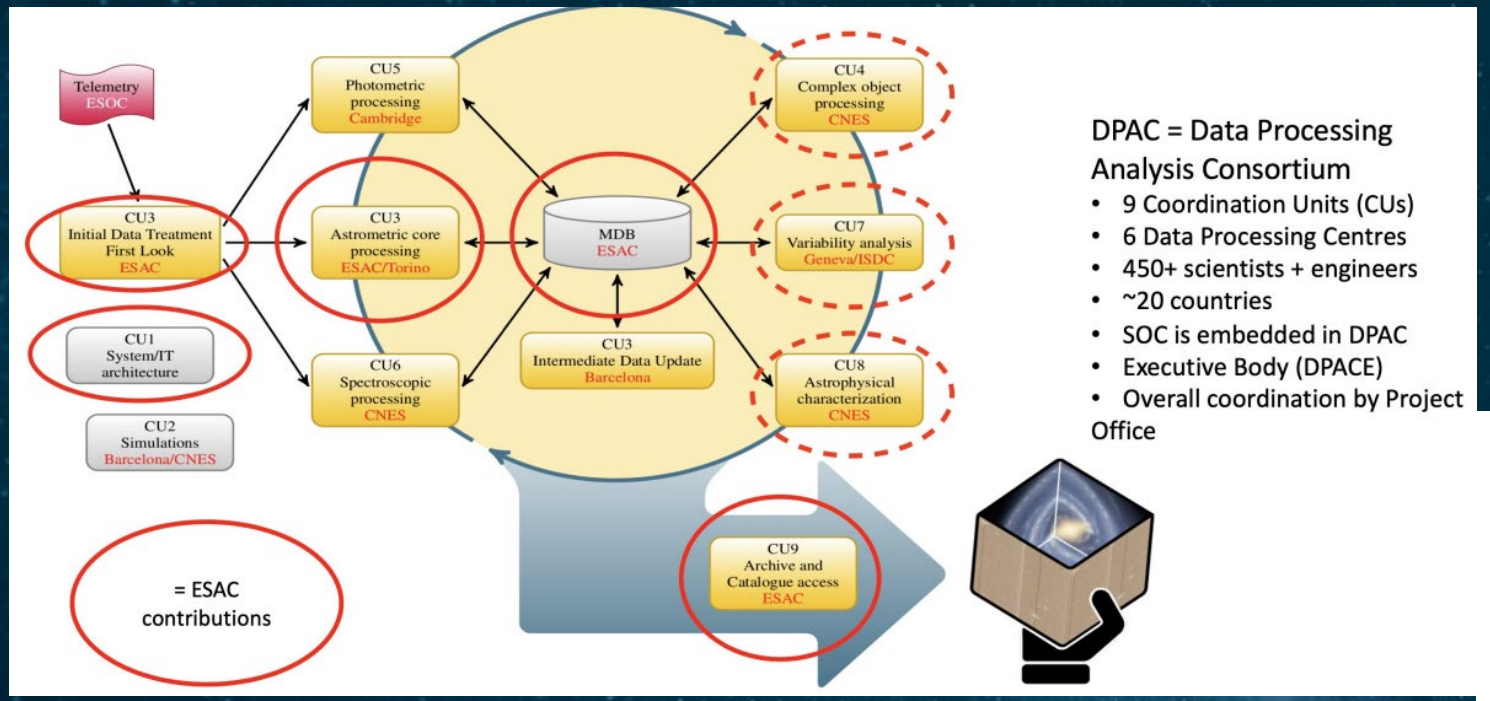
Science Operations Visibility, Reporting & Knowledge Management

Coordination with Science Communities for Operations & User (Science) Support

Science Operations Systems Study, Design & Requirements	Science Operations Planning	Science Instrument Handling	Science Data Processing	Science Data Archiving
Translation of mission and science scenarios into requirements. Identification of most efficient system architecture and processes.	Generation of conflict-free and optimised science instrument operations plan, timelines and command sequences in close cooperation with instrument teams.	Preparation, calibration and operations of science instruments and/ or support to these activities.	Provision of automatic and/or interactive data processing capabilities and generation of science products incl. quick look analysis products	Provision of mission data archive with interfaces, services and tools for optimised science generation, science operations and long-term preservation.

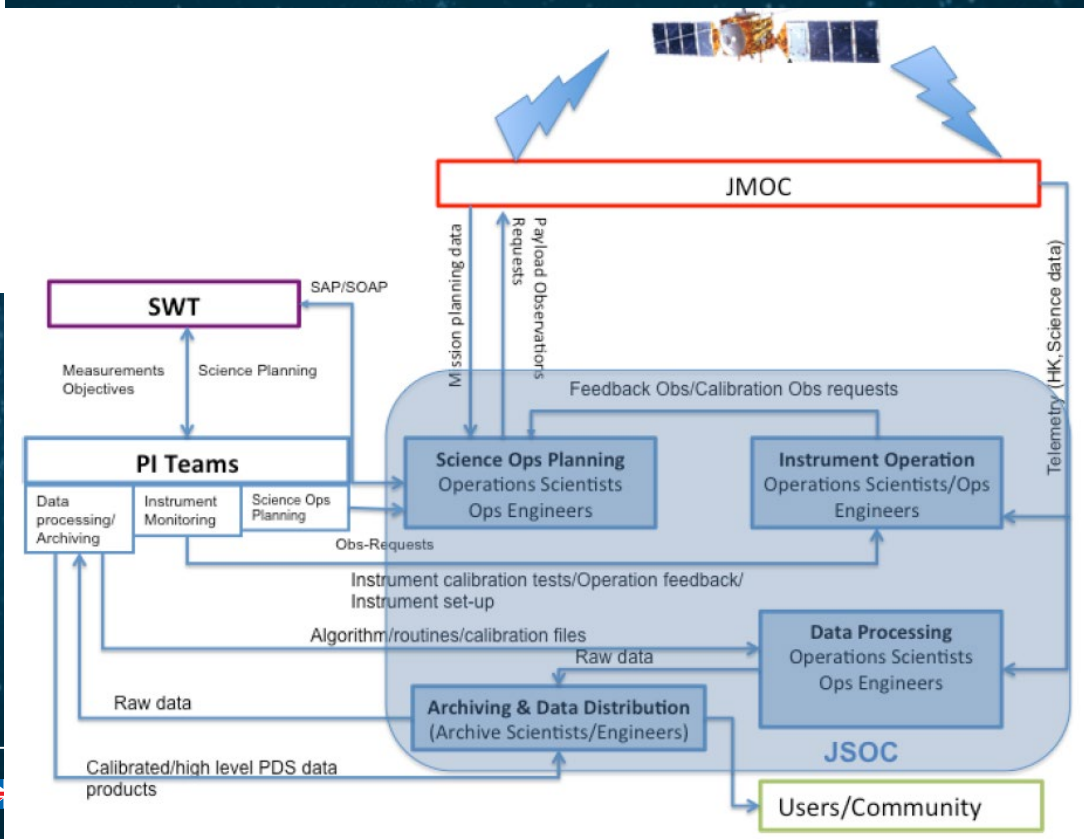
- Distributed responsibilities between ESA (SOC) and external Instrument Teams or Consortium
- Mix of Scientists and Engineers
- Lots of Software Systems
- Systems need to be open towards external users

Distributed Science Ground Segments



DPAC = Data Processing Analysis Consortium

- 9 Coordination Units (CUs)
- 6 Data Processing Centres
- 450+ scientists + engineers
- ~20 countries
- SOC is embedded in DPAC
- Executive Body (DPACE)
- Overall coordination by Project Office



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GAIA EARLY DATA RELEASE 3

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1 811 709 771
stellar positions

1 806 254 432
brightness
in white light

1 542 033 472
brightness
in blue light

1 540 770 489
colour

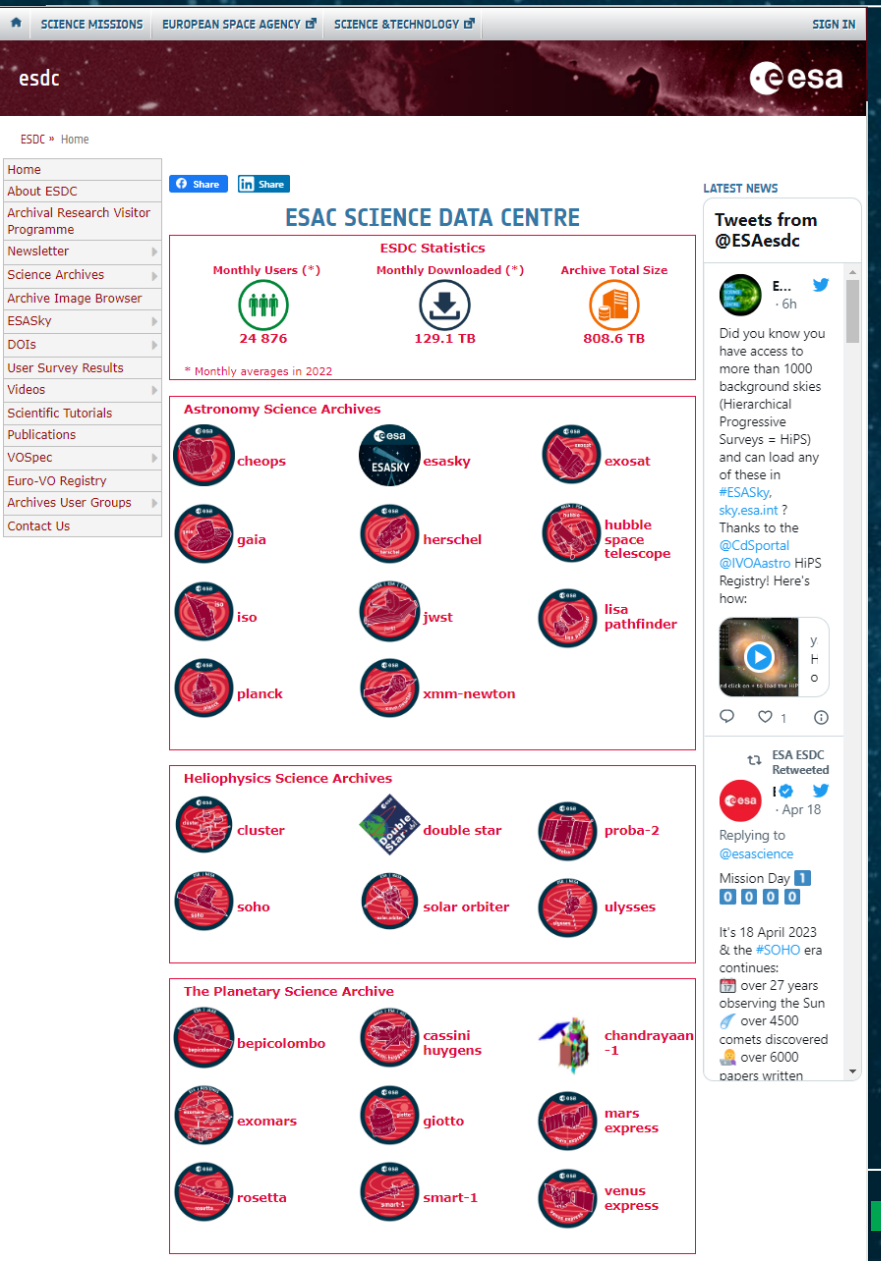
1 554 997 939
brightness
in red light

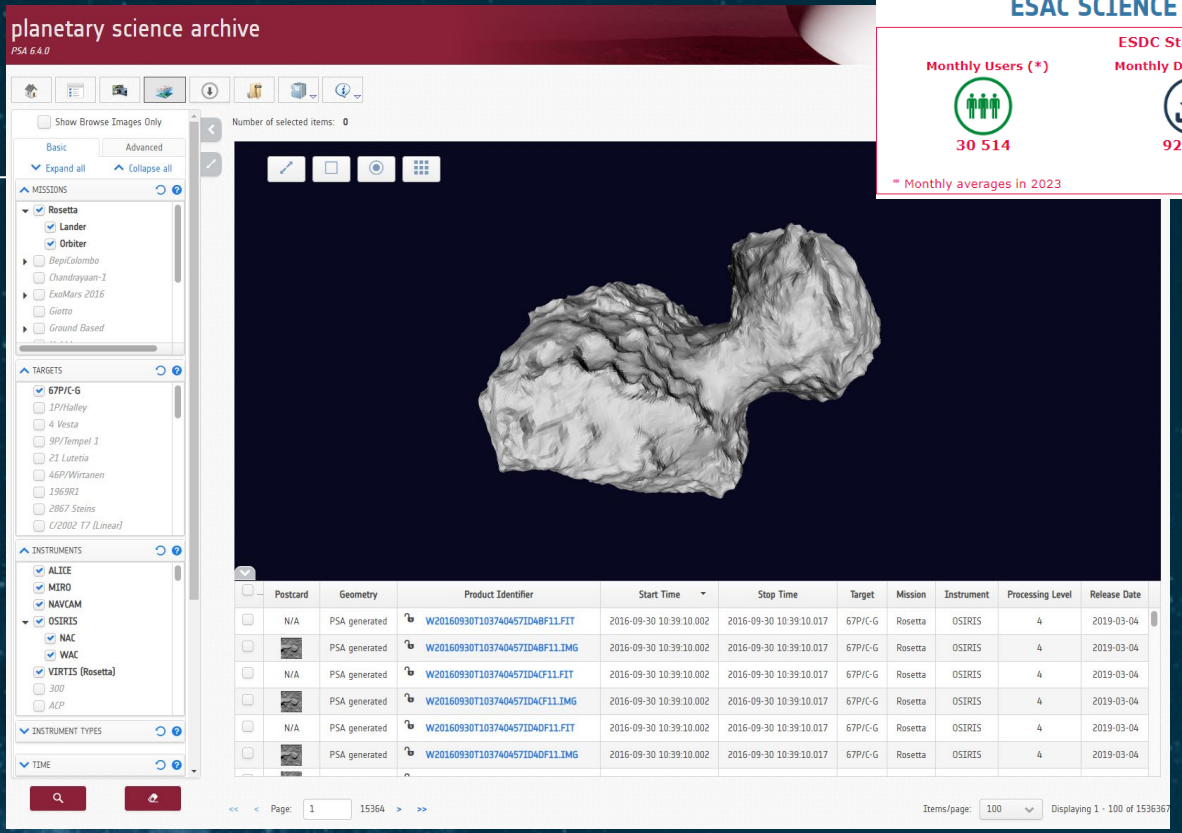
1 467 744 818
parallax and
proper motions

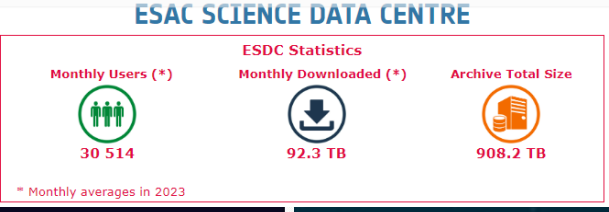
1 614 173
extragalactic
sources

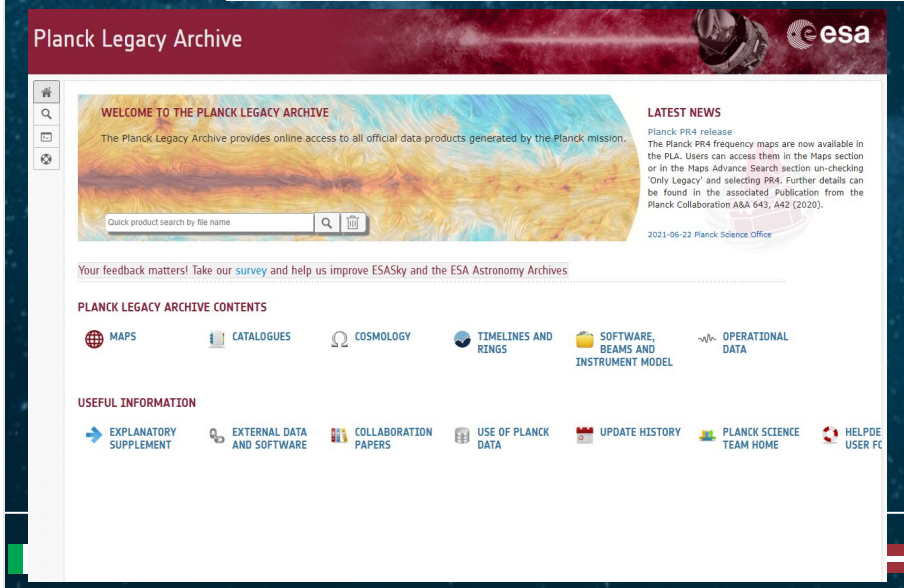
#SpaceCare #ExploreFarther

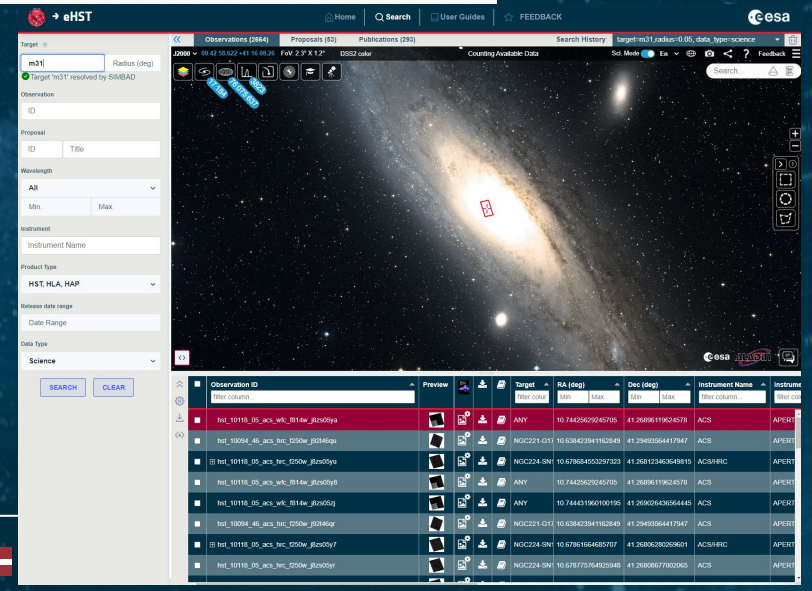
ESAC Science Data Centre



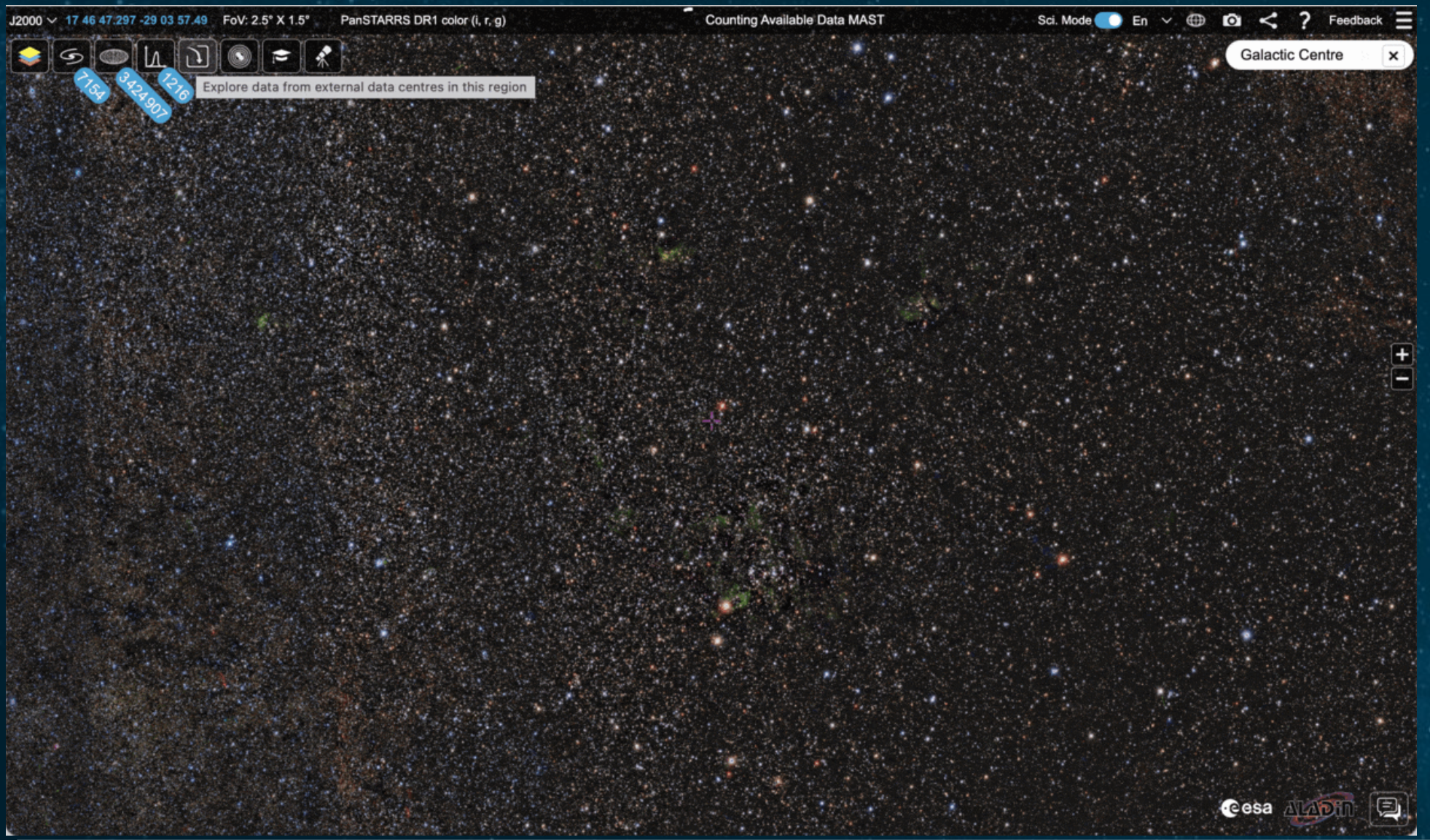








ESASky: an open window to the universe



Access to all astronomical data from ESA Archives and others (NASA, JAXA, Ground-based telescopes, …)

Use of international data interoperability standards (Virtual Observatory)

Open Science Data

https://sky.esa.int

Lots of Software needs Strong PA&S support

Establish and get approval for specific Product Assurance and Safety requirements baseline for all Missions and Projects, in compliance with ESA PA&S policy.

Review Service Contractors PA&S plans, specifications and effort. Guide and monitor their implementation.

Encourage commonalities across the various mission’ teams and contractors' teams, support to SCI-S System Engineering Environment common templates

Monitoring the development, integration and test activities, within ESA and the contractors, with quality assurance assessments, mandatory and key inspection points, test witnessing and configuration inspections.

PA support to ESAC Project Reviews, and Lessons Learned Process

Support ESAC Software Licensing Board and missions in their request for open-source software

Why are we doing all this ?

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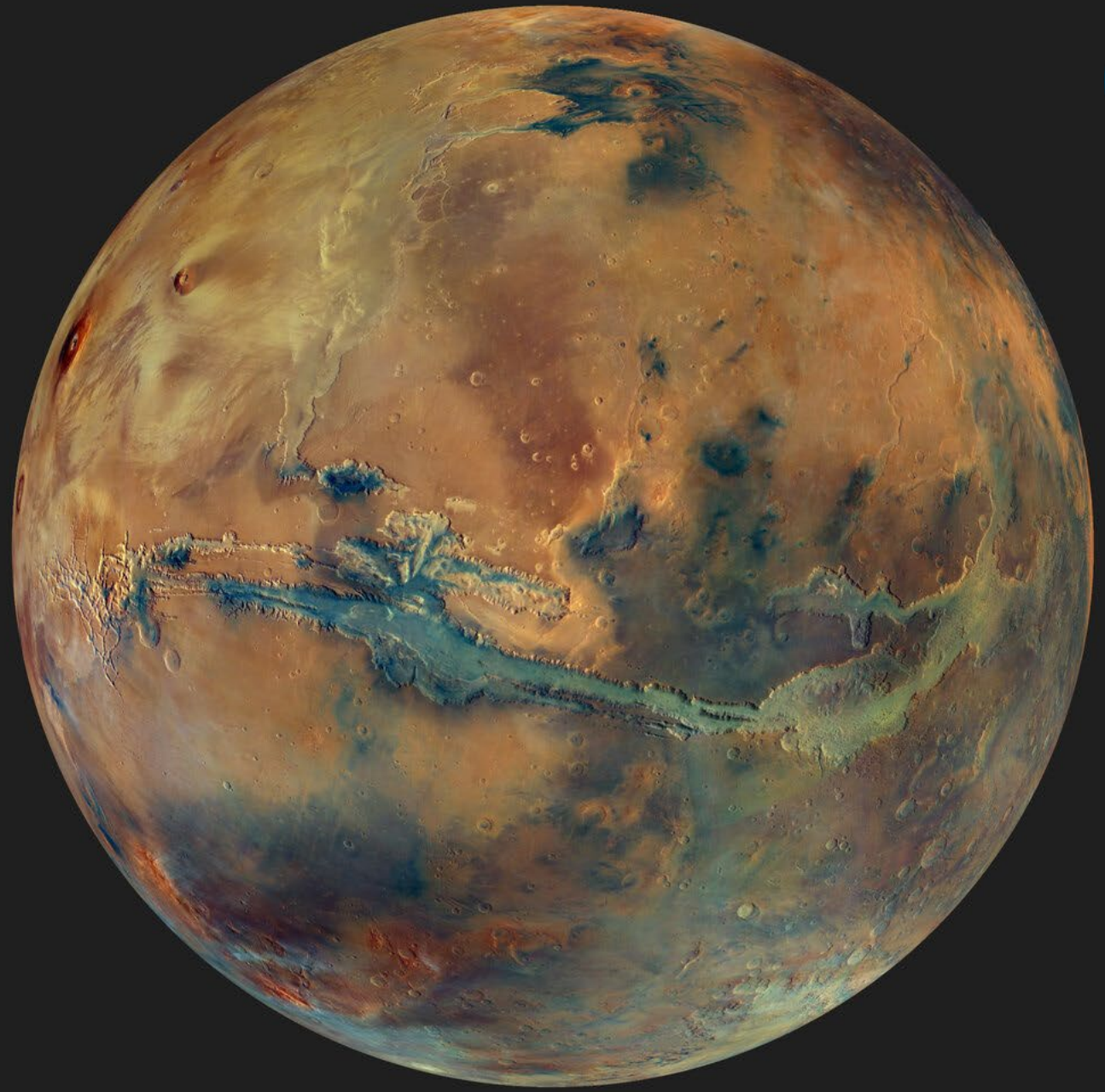
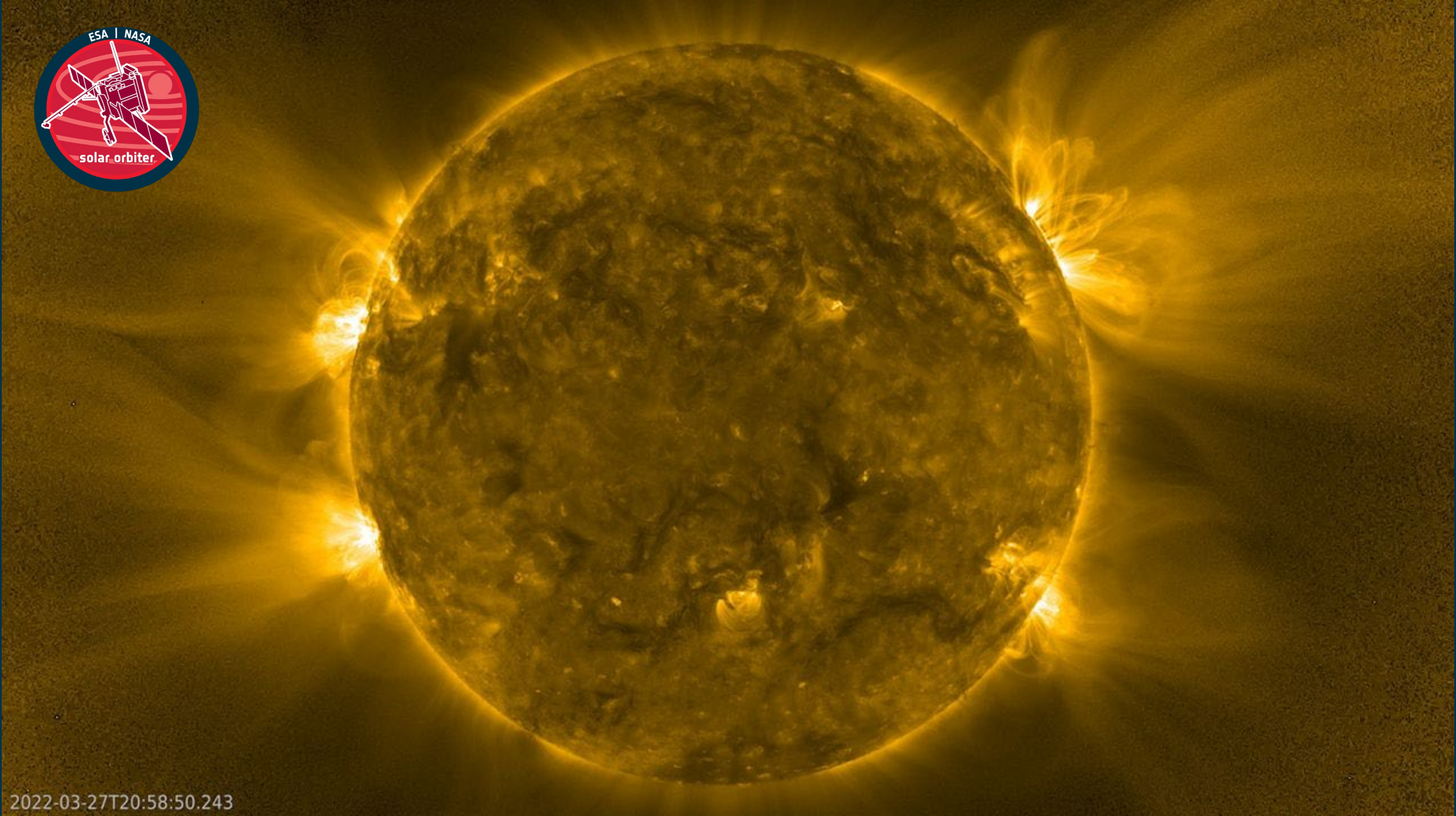
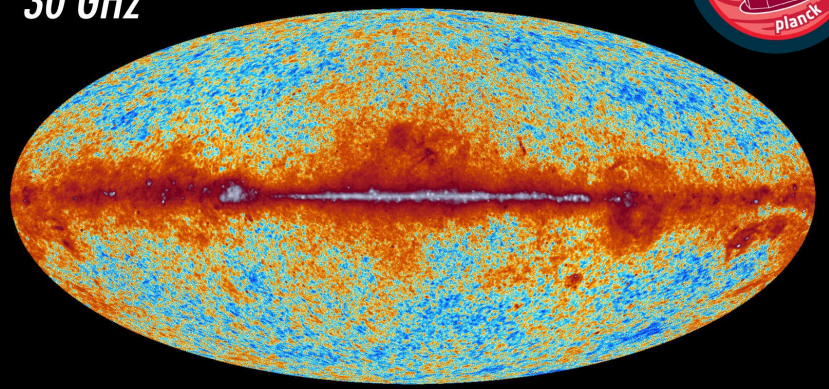
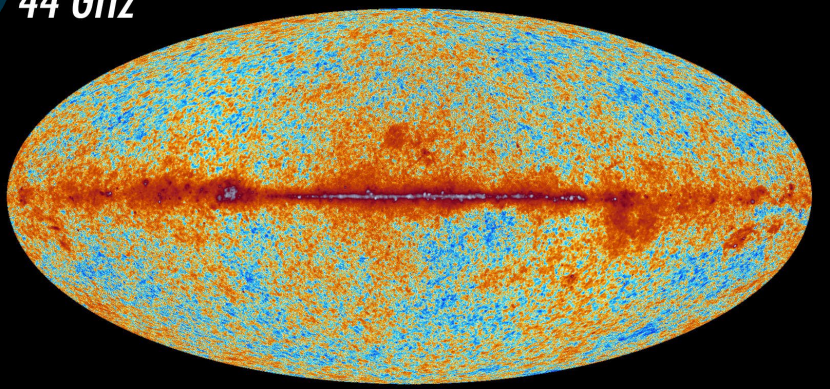
NASA | ESA | CSA
jwst

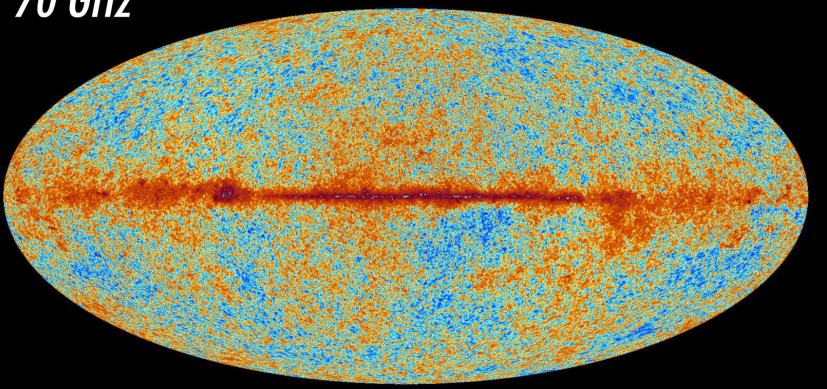


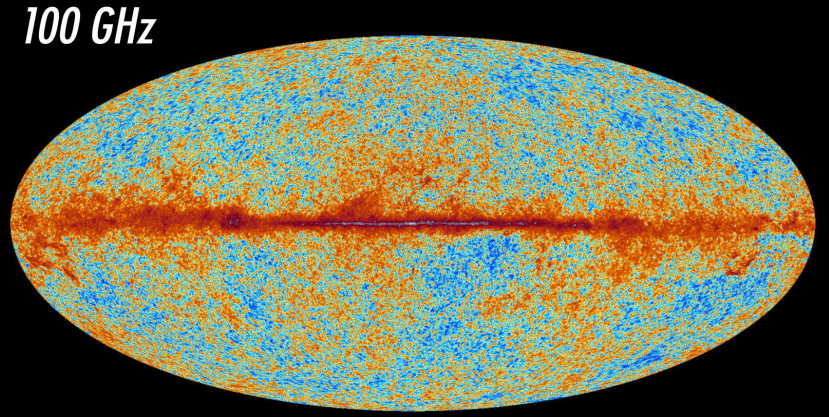

ESA | NASA
solar orbiter
2022-03-27T20:58:50.243

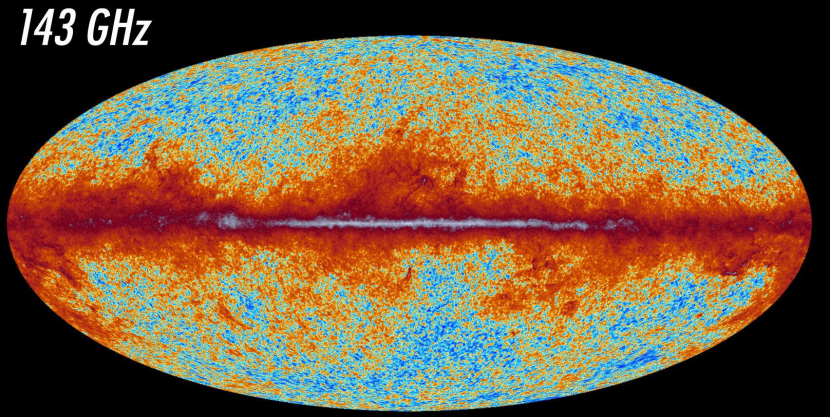
The Planck 2015 view of the sky

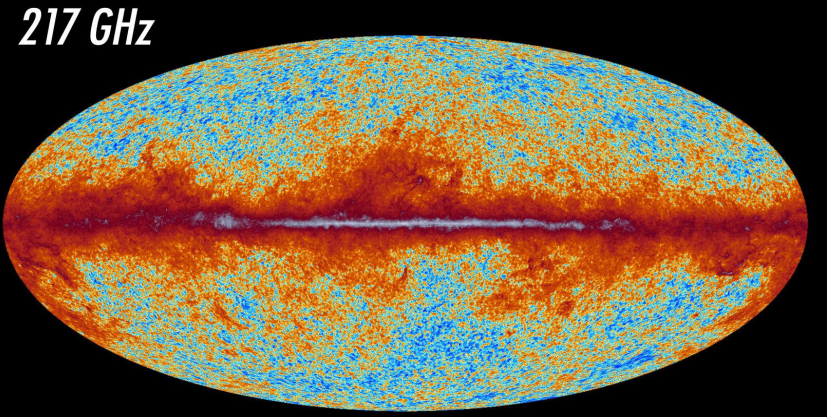


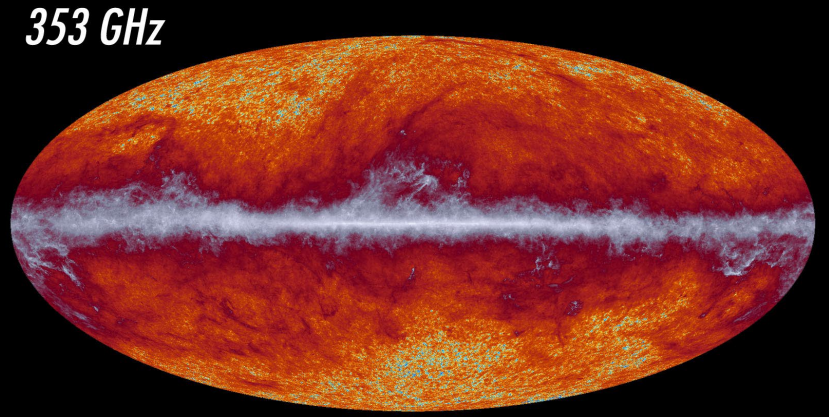


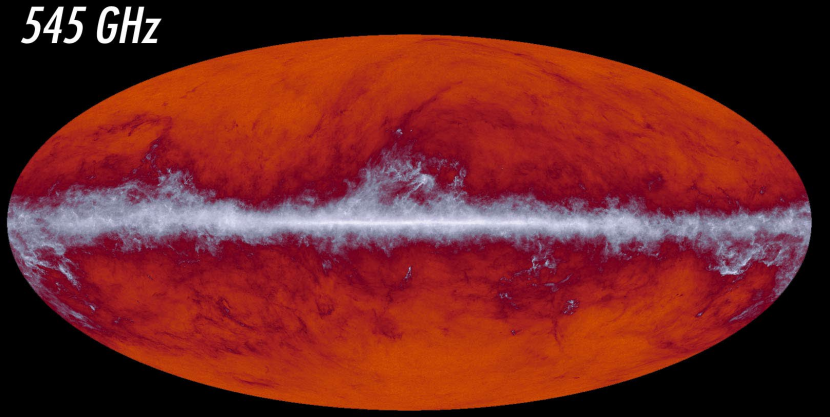


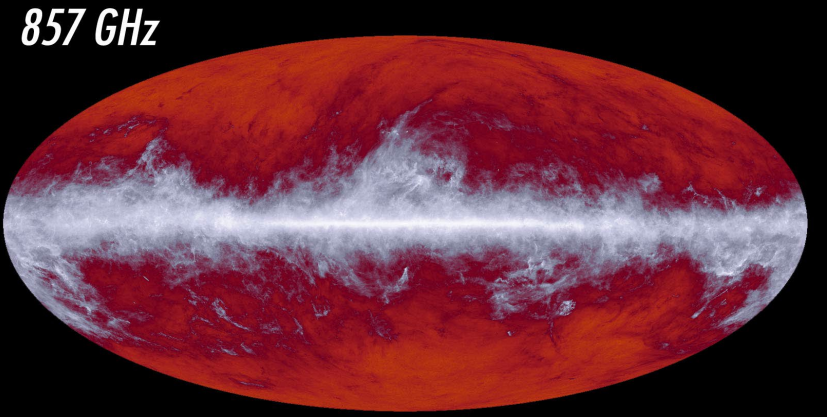












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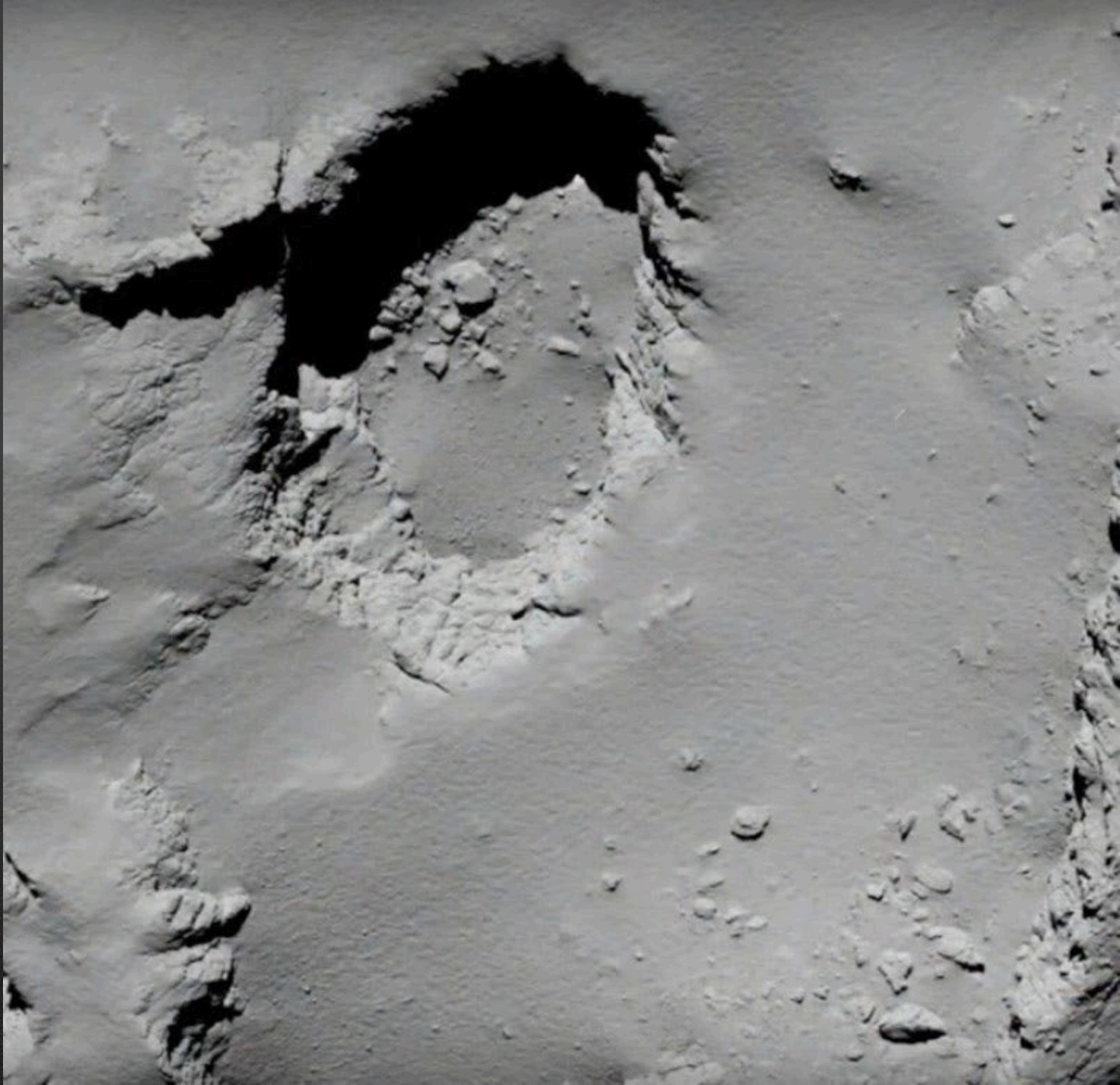
rosetta



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hubble

Thank you and enjoy the workshop !